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(71) Applicant (for TJ only): FRIEDMAN, Mark, M. [US/IL]; Alharizi 1, 43406 Raanana (IL).			
(71)(72) Applicants and Inventors: WEINER, Avish, Jacob [IL/IL]; Boyer Street 12, 69127 Tel Aviv (IL). GANOR, Michael [IL/IL]; Shocken Street 27, 66532 Tel Aviv (IL).			
(74) Common Representative: FRIEDMAN, Mark, M.; c/o Castorina, Anthony, Suite 207, 2001 Jefferson Davis Highway, Arlington, VA 22202 (US).			

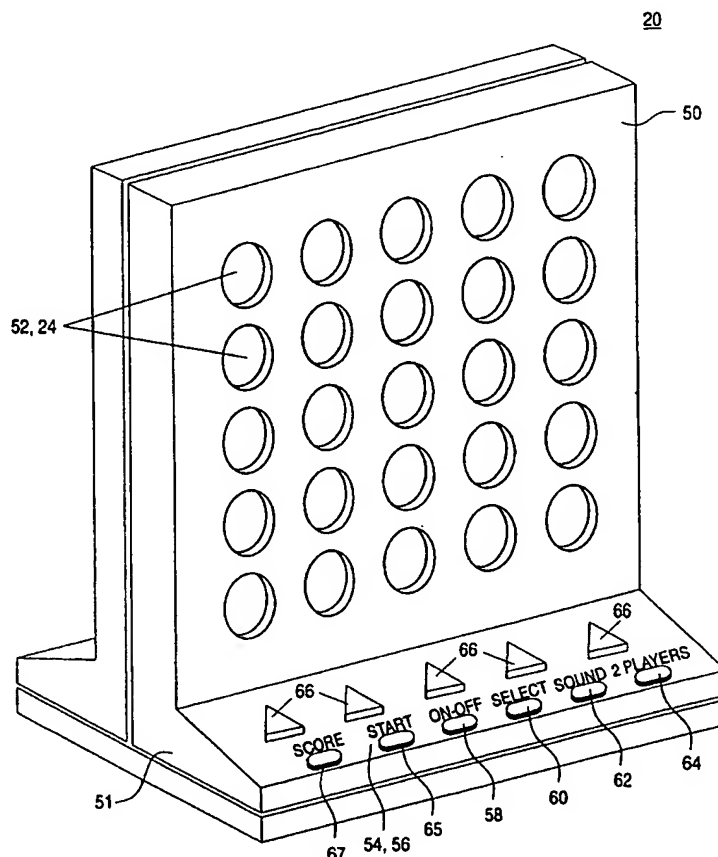
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## (57) Abstract

An electronic game (20) comprising an electronic game board (50) having an array of indicators (52, 24) and a column selecting mechanism (66) for selecting a specific column of the columns.



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ELECTRONIC GAME

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to an electronic game and, more particularly, to an electronic game which mimics and/or modifies a traditional mechanical connect-four game and to methods of playing the electronic game.

A prior art connect-four game includes a vertical apparatus having an a seven by seven array of openings or windows. The apparatus is adapted to accept forty-nine beads into the array, and to present the beads via the openings. Being vertical, the insertion of the beads into the apparatus is via the upper end of five columns, wherein the position of any specific bead in the array is determined by the column selected to insert the bead and the number of beads already present in that column. For example, if two beads are already present in the third column, engaging the first (lowest) and second rows, then the third bead inserted via the third column would engage the third row.

The traditional connect-four game is designed for two players and is conducted as follows. Each of the players has beads having a different color, say red beads for the first player and green beads for the second player. In each turn of the game, one of the players inserts one of his/her beads into the apparatus, with the aim to create a connect-four situation, and to block the opponent from achieving a connect-four situation. A connect four situation may be defined in various ways. Most commonly it is defined as a continuous line, either vertical, horizontal or diagonal, of four beads having the same color. Thus, when inserting a bead, the player must consider the existing arrangement of beads in the array, which were inserted by him/her or the other player and to further consider the yet non-engaged positions which are available for additional beads of himself or his opponent.

Being non-electronic, the prior art connect-four game suffers few limitations. First, it requires two players, i.e., it cannot be played solitary. Second, the beads need to be stored appropriately, and should some of the beads get lost, such that the number of beads of a specific color decreases  
5 below twenty-five, the game is not playable. Third, the game is restricted to a vertical configuration. And, fourth, as will become apparent from the following description, a non-electronic connect-four game is limited with respect to game versatility as compared with an electronic connect-four game.

10 There is thus a widely recognized need for, and it would be highly advantageous to have, an electronic connect-four game devoid of the above limitations.

#### SUMMARY OF THE INVENTION

15 According to the present invention there is provided an electronic game which can be used to replace the traditional mechanical connect-four game and to provide more versatility and complexity to it.

According to further features in preferred embodiments of the invention described below, the electronic game comprising (a) an electronic  
20 game board having an array of indicators, the array of indicators having a first end and a second end, such that columns of indicators are situated substantially perpendicular to the ends, whereas rows of indicators are situated substantially parallel to the ends, each of the indicators being either at a default off state or at one of a first on state and a second on state; and  
25 (b) a column selecting mechanism for selecting a specific column of the columns, such that a specific indicator of the specific column, which is the closest off state indicator to the first end, is changed to one of the on states.

According to still further features in the described preferred embodiments the game board includes a liquid crystal display.

According to still further features in the described preferred embodiments the electronic game further comprising (c) a vertical housing, the housing being for accommodating the board and column selecting mechanism, wherein each of the indicators is formed as a window in the housing, within the housing and behind each of the windows present are a first led of a first color and a second led of a second color, such that when a given indicator acquires one of the on states, one of the leds is activated.

According to still further features in the described preferred embodiments the column selecting mechanism includes at least one key.

According to still further features in the described preferred embodiments while the specific indicator of the specific column is changed to one of the on states, the on state locomotes along indicators of the specific column from the second end to the specific indicator.

According to still further features in the described preferred embodiments the array is a five by five array.

According to still further features in the described preferred embodiments wherever a plurality of indicators of a given column acquires one or the other of the on states, each of the on states shifts its location along the given column a single indicator towards the first end.

This may happen either substantially simultaneously or immediately after the given column has acquired a plurality of on states, so that an indicator closest to the second end acquires the off state, or alternatively, it may happen only when the given column is reselected by the column selecting mechanism.

According to still further features in the described preferred embodiments wherever a plurality of indicators of a given column acquires

one or the other of the on states, each of the on states present in the array shifts its location along its respective column a single indicator towards the first end.

According to still further features in the described preferred  
5 embodiments provided is a method of playing an electronic game by first and second player, the method comprising the steps of (a) providing (i) an electronic game board having an array of indicators, the array of indicators having a first end and a second end, such that columns of indicators are situated substantially perpendicular to the ends, whereas rows of indicators  
10 are situated substantially parallel to the ends, each of the indicators being either at a default off state or at one of a first on state and a second on state, the on states being determined in alternating turns of the game by the first and second players, respectively; and (ii) a column selecting mechanism for selecting a specific column of the columns, such that a specific indicator of the specific column, which is the off state indicator present closest to the  
15 first end, is changed to one of the on states; and (b) in alternating turns, via the column selecting mechanism, the first and second players selecting specific columns, such that the specific indicator of a selected column, which is the off state indicator present closest to the first end, is changed to  
20 one of the on states, as appropriate to any of the players, the selection being according to a rational, the rational including a major aim of forming a continuous line of a number of indicators all having a same on state, as appropriate to any of the players, and a secondary aim of preventing the other player from forming a continuous line of the number of indicators all  
25 having a same on state, as appropriate to the other player.

According to still further features in the described preferred embodiments the first player is an electronic device.

According to still further features in the described preferred embodiments while changing the default off state, of any specific indicator of a given column, to one or the other of the first and second on states, as appropriate to any of the players, the appropriate on state locomotes along  
5 indicators of the given column from the second end to the specific indicator.

According to still further features in the described preferred embodiments when the continuous line of the number of indicators all having the same on state is achieved, a wining effect is actuated.

According to still further features in the described preferred  
10 embodiments the array is a five by five array and the number equals four.

According to still further features in the described preferred embodiments wherever a plurality of indicators of a given column acquires one or the other of the on states, each of the on states shifts its location along the given column a single indicator towards the first end, so that an  
15 indicator closest to the second end acquires the off state.

According to still further features in the described preferred embodiments wherever a plurality of indicators of a given column acquires one or the other of the on states, each of the on states present in the array shifts its location along its respective column a single indicator towards the  
20 first end.

The present invention successfully addresses the shortcomings of the presently known configurations by providing an electronic connect-four game which is more versatile, complex and interesting as compared with the traditional mechanical games of the type.

25

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention herein described, by way of example only, with reference to the accompanying drawings, wherein:

FIGs. 1-13 schematically demonstrate the principles of the electronic game according to the present invention played in a classic connect-four mode;

FIG. 14 schematically demonstrates the principle of the electronic game according to the present invention played according to one of its new modes; and

FIG. 15 is a perspective view of the game according to the present invention according to one of its embodiments.

#### 10 DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is of an electronic game which can be used to play by two players or solitary. Specifically, the present invention can be used to replace the traditional connect-four game, and to provide new dimensions and interest to that fascinating game.

15 The principles and operation of an electronic game according to the present invention may be better understood with reference to the drawings and accompanying descriptions.

Referring now to the drawings, Figures 1-13 illustrate the basic concept of the electronic game according to the present invention, which is referred to hereinbelow as game 20.

Game 20 includes an electronic game board 22. Board 22 has an array (e.g., five by five) of indicators 24. Array of indicators 24 has a first end 26 and a second end 28, such that columns 30 of indicators 24 are situated substantially perpendicular to said ends, whereas rows 32 of indicators 24 are situated substantially parallel to said ends.

Board 22 may be any suitable color or black and white liquid crystal display (LCD). Board 22 may be a touch screen. A touch screen may be



used as a column selecting mechanism, as further detailed below. Further options for board 22 are described hereinbelow.

The terms "columns" and "rows" are used herein to differentiate between lines of indicators situated perpendicular and parallel to the ends,  
5 respectively.

However, there is no intention to limit the columns to poses a vertical orientation, or to limit the rows to poses a horizontal orientation.

Therefore, a column is defined herein as a line of indicators extending from end to end in a substantially perpendicular fashion, whereas  
10 a row is defined herein as a line of indicators which is substantially parallel to the ends.

Each of indicators 24 is either at a default "off" state (marked as open circles) or at one of a first "on" state (marked as closed light circles) and a second "on" state (marked as closed dark circles).

15 Before playing, all indicators 24 are "off", whereas the "on" states are thereafter determined in alternating turns of the game by a first player and a second player, respectively, according to a set of principles which are described hereinafter.

Thus, for each of the players the principles of the game include  
20 changing the default "off" state, of any specific indicator 24, to one of the first and second "on" states, as appropriate to that player. Changing the state as described is effected by selecting a specific column via a column selecting mechanism, as further detailed hereinbelow.

The indicator changed in each of Figures 1-13, which present 13  
25 successive alternating turns of the game according to the present invention, is marked with a full head arrow.

Further according to the principles of the game, the specific indicator of the specific column which is changed, as described, from "off" to "on", is

situated adjacent to first end 26, as exemplified in Figures 1, 3 and 9 for the first player and Figure 4 for the second player.

Alternatively, the specific indicator is situated adjacent to another specific indicator who has already been acquired one of the "on" states, as  
5 exemplified in Figures 5, 7, 11 and 13 for the first player and Figures 2, 6, 8, 10 and 12 for the second player.

The rational of the game, similar to the traditional connect-four game, is to form a continuous line of a number of indicators 24 all having the same "on" state, as appropriate to each of the players. It is further the  
10 rational of the game to prevent the other player from forming such a continuous line.

The continuous line may be horizontal, vertical or diagonal, and the number of the indicators forming the line is preferably four, as in the prior art connect-four game, which is described in the background section above.

15 Thus, the principles and rational of the game according to the present invention, as so far described, are similar to the principles and rational of the classic connect-four game described above.

However, the electronic game according to the present invention enjoys major advantages with respect to the prior art mechanical connect-  
20 four game.

First, the electronic game does not call for two human players, since one of the players may be replaced by an electronic (computing) device implemented in the game. Therefore, the electronic game according to the present invention can also be played solitary. One ordinarily skilled in the  
25 art would know how to devise a suitable electronic computing device, suitable for replacing a human player and implement that device in the electronics of the game. Such a device would typically rank all options of a given number of steps ahead, and would play according to the highest rank.

Selecting the number of steps ahead and the ranking system and/or inserting some random moves may be used to determine the level of the electronic player, all as well known in the art.

Second, since no beads are involved, the problem of lost beads  
5 becomes irrelevant. And third, the game is not limited to a vertical orientation as does the prior art connect-four game.

With reference now to Figure 14, presented is an additional principle of the game of the present invention. According to that principle, each time a plurality (e.g., all) of indicators of a given column **30a** acquire one or the  
10 other of the "on" states, each of the "on" states shifts its location along the given column **30a** a single indicator towards first end **26**.

This may happen either substantially simultaneously or immediately after that given column **30a** has acquired the plurality of "on" states, so that an indicator closest to second end **28** acquires the "off" state. Alternatively,  
15 it may happen only when given column **30a** is reselected by the column selecting mechanism.

This feature adds complexity and interest to the game according to the present invention, since a player has to take into consideration the relative shift in the location of the "on" states of the given column with  
20 respect to the rest of the "on" and "off" states present on the array at that stage of the game.

According to still additional principle of the game of the present invention, each time a plurality (e.g., all) of the indicators of a given column acquire one or the other of the "on" states, each of the "on" states present at  
25 that stage of the game shifts its location along its respective column a single indicator towards first end **26**.

This feature adds a mode of continuity to the game according to the present invention, since repeating this process mimics a situation wherein the number of rows is unlimited.

These two embodiments of the invention provide greater versatility,  
5 complexity and interest to the game as compared with the game played according to the classic principles. As opposed to the classic game which is characterized by many tide situations, the new principles, by adding modes of continuity and/or complexity, are both characterized by reducing the potential number of tide situations.

10 In a preferred embodiment of the invention, when changing the default "off" state of any specific indicator of a given column, to one or the other of the first and second on states, as appropriate to any of the players, the appropriate on state locomotes along indicators of the given column from second end 28 to the specific indicator. This feature of the electronic  
15 game according to the present invention mimics the migration of beads in the mechanical connect-four game.

The electronic game according to the invention may be devised as a portable game-boy or, by providing a suitable software, it can be played using a suitable computer, e.g., a personal computer (PC). One ordinarily  
20 skilled in the art would know how to devise the appropriate software or construct the game-boy apparatus.

Figure 15 presents a presently preferred embodiment for the construction of the electronic game according to the present invention, which mimics the construction of a prior art connect-four game.

25 Thus, according to the embodiment of Figure 15, game 20 includes a vertical housing 50 formed with a base 51. Each of indicators 24 are formed as windows 52 in housing 50. Behind each of windows 52 present are a first led of a first color (e.g., green) and a second led of a second color

(e.g., red), such that when a specific indicator is in one of the "on" states, the appropriate led is activated. Thus, when both the leds of a specific indicator are off, that indicator is in its "off" state, whereas when one of the leds is on, that indicator is in one of its "on" states. In a preferred embodiment of the invention, the first and second leds are combined into a single two color led, as well known in the art.

As further shown in Figure 15, game 20 further includes a control mechanism 54 for operating and playing with the game.

In the specific example of Figure 15 provided is a keyboard 56 which includes control keys and playing keys. Collectively, the playing keys form a column selecting mechanism. However, as will be appreciated by one ordinarily skilled in the art, providing game 20 with a touch screen abolishes the need for many or all of the keyboard functions, since the screen itself functions both as the game board and the keyboard.

The control keys include an "on-off" key 58 for operating the game, a mode selection key 60 for selecting among the options of a classic game or one of the two modifications to the classic game hereinabove described, a sound key 62 for activating or deactivating sound associated effects that may accompany the visual effects of the game, a players number mode key 64 for selecting between the two players and the solitaire modes of the game. Preferably the solitaire mode is the default. The control keys further include a start key 65 for starting the game following the selection of preferences as described. Preferably a score key 67 is also included. Key 67 is used to display the score of each player or the difference in score between the players. For example, if the first player has won six times and lost three times, pressing the score key may result in three green leds operated, etc. However, additional control keys may be present.

The playing keys which constitute the column selecting mechanism in the example of Figure 15 include column selecting keys 66, one for each of the columns, for selecting indicators of choice while playing the game according to the principles hereinabove described.

5        In a preferred embodiment of the invention two sets or alternatively one full set and one partial set (which includes only column selecting keys 66) are provided, such that each of the players has its own control keys or keyboard.

10        In this case, in a preferred embodiment, the two sets of control keys are arranged on both sides of housing 50, such that the players may face each other while playing the game. To this end, windows 52 are selected double sided, such that both players may view the leds from both sides of housing 50.

15        In a preferred embodiment of the invention, when the continuous line of indicators all having the same "on" state is achieved by any of the players, a wining effect is actuated. The wining effect may be visual and/or audial. Should the wining effect selected to be visual, it is preferably associated with the wining player. For example if the player playing red has won the game, a wining associated pattern of red lights may form the  
20        wining effect.

25        In another preferred embodiment of the invention a random starting player selection mechanism is enacted when the game is started. Starting player selection mechanism serve to select a player which will start the game. Such a player has an inherent advantage over his opponent, and therefore a randomized selection of the starting player is preferred. Thus the players first select their associated "on" states (e.g., red and green) and than, in a random fashion, the selection mechanism indicates which "on" state was selected, the associated player goes first.

In a preferred embodiment of the invention the game further includes a score recording and displaying device implemented within housing 50. score recording and displaying device is used to score points according to predetermined scoring rules for any of the players and to display the recorded scores. Records may be for a single game and/or a series of games, as well known in the art of electronic games.

Further according to the present invention provided is a method of playing an electronic game, the method includes the following steps.

First the players are provided with an electronic game board which has an array of indicators. The array of indicators has a first end and a second end, such that columns of indicators are situated substantially perpendicular to the ends, whereas rows of indicators are situated substantially parallel to the ends. Each of the indicators is either at a default "off" state or at one of a first "on" state and a second "on" state. The "on" states are determined in alternating turns of the game by the players. The players are further provided with a column selecting mechanism for selecting a specific column of the columns provided, such that a specific indicator of the specific column, which is the off state indicator closest to the first end at that stage of the game, is changed to one of the on states.

Second, in alternating turns, via the column selecting mechanism, the first and second players select specific columns, such that the specific indicator of a selected column, which is the "off" state indicator present closest to the first end, is changed to one of the "on" states, as appropriate to any of the players. The selection is performed according to a rational which includes a major aim of forming a continuous line of a number of indicators all having a same "on" state, as appropriate to any of the players, and a secondary aim of preventing the other player from forming a continuous

line of that number of indicators all having the same "on" state, as appropriate to the other player.

While the invention has been described with respect to a limited  
5 number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made.



## WHAT IS CLAIMED IS:

1. An electronic game comprising:
  - (a) an electronic game board having an array of indicators, said array of indicators having a first end and a second end, such that columns of indicators are situated substantially perpendicular to said ends, whereas rows of indicators are situated substantially parallel to said ends, each of said indicators being either at a default off state or at one of a first on state and a second on state; and
  - (b) a column selecting mechanism for selecting a specific column of said columns, such that a specific indicator of said specific column, which is the closest off state indicator to said first end, is changed to one of said on states.
2. The electronic game of claim 1, wherein said game board includes a liquid crystal display.
3. The electronic game of claim 1, further comprising:
  - (c) a vertical housing, said housing being for accommodating said board and column selecting mechanism,wherein each of said indicators is formed as a window in said housing, within said housing and behind each of said windows present are a first led of a first color and a second led of a second color, such that when a given indicator acquires one of said on states, one of said leds is activated.
4. The electronic game of claim 3, wherein said first and second led are combined into a single two color led.

5. The electronic game of claim 1, wherein said column selecting mechanism includes at least one key.

6. The electronic game of claim 1, wherein while said specific indicator of said specific column is changed to one of said on states, said on state locomotes along indicators of said specific column from said second end to said specific indicator.

7. The electronic game of claim 1, wherein said array is a five by five array.

8. The electronic game of claim 1, wherein wherever a plurality of indicators of a given column acquires one or the other of said on states, each of said on states shifts its location along said given column a single indicator towards said first end.

9. The electronic game of claim 1, wherein when each of said on states shifts its location along said given column a single indicator towards said first end, an indicator closest to said second end acquires said off state.

10. The electronic game of claim 1, wherein wherever a plurality of indicators of a given column acquires one or the other of said on states, each of the on states present in said array shifts its location along its respective column a single indicator towards said first end.

11. A method of playing an electronic game by first and second player, the method comprising the steps of:

(a) providing:

- (i) an electronic game board having an array of indicators, said array of indicators having a first end and a second end, such that columns of indicators are situated substantially perpendicular to said ends, whereas rows of indicators are situated substantially parallel to said ends, each of said indicators being either at a default off state or at one of a first on state and a second on state, said on states being determined in alternating turns of the game by the first and second players, respectively; and
  - (ii) a column selecting mechanism for selecting a specific column of said columns, such that a specific indicator of said specific column, which is the off state indicator present closest to said first end, is changed to one of said on states; and
- (b) in alternating turns, via said column selecting mechanism, the first and second players selecting specific columns, such that said specific indicator of a selected column, which is the off state indicator present closest to said first end, is changed to one of said on states, as appropriate to any of the players, said selection being according to a rational, said rational including a major aim of forming a continuous line of a number of indicators all having a same on state, as appropriate to any of the players, and a secondary aim of preventing the other player from forming a continuous line of said number of indicators all having a same on state, as appropriate to the other player.

12. The method of claim 11, wherein said first player is an electronic device.

13. The method of claim 11, wherein while changing said default off state, of any specific indicator of a given column, to one or the other of said first and second on states, as appropriate to any of the players, said appropriate on state locomotes along indicators of said given column from said second end to said specific indicator.

14. The method of claim 11, wherein when said continuous line of said number of indicators all having said same on state is achieved, a wining effect is actuated.

15. The method of claim 11, wherein said array is a five by five array and said number equals four.

16. The method of claim 11, wherein wherever a plurality of indicators of a given column acquires one or the other of said on states, each of said on states shifts its location along said given column a single indicator towards said first end.

17. The method of claim 11, wherein wherever a plurality of indicators of a given column acquires one or the other of said on states, each of the on states present in said array shifts its location along its respective column a single indicator towards said first end.

FIG. 1

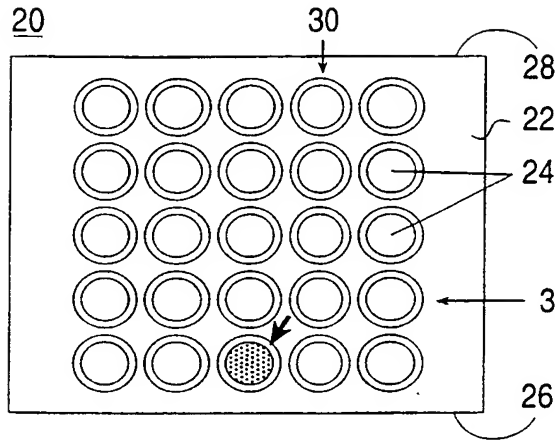


FIG. 2

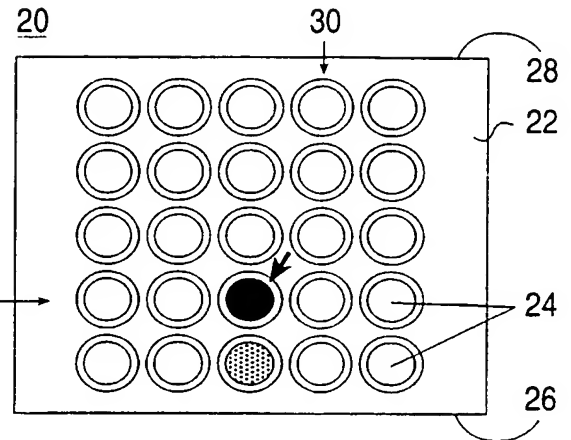


FIG. 3

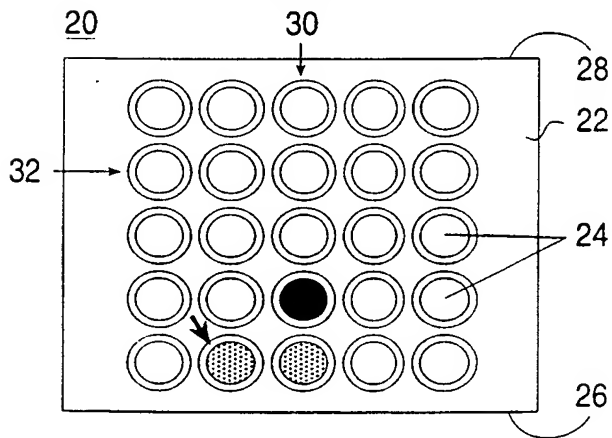


FIG. 4

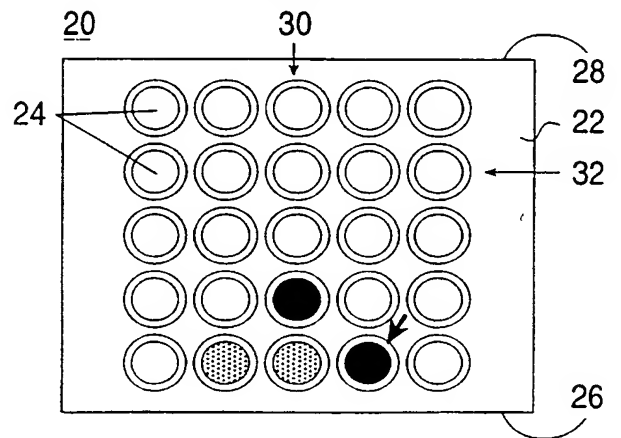


FIG. 5

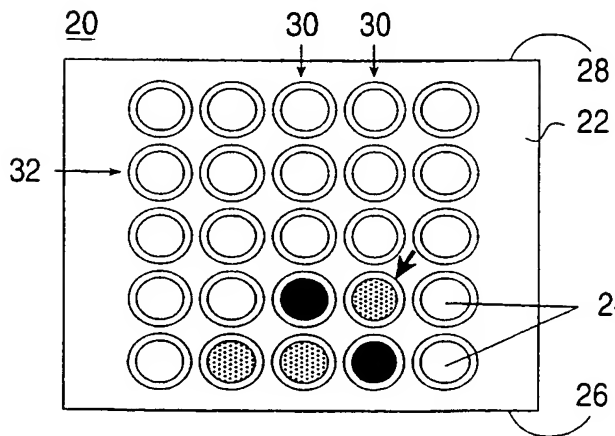


FIG. 6

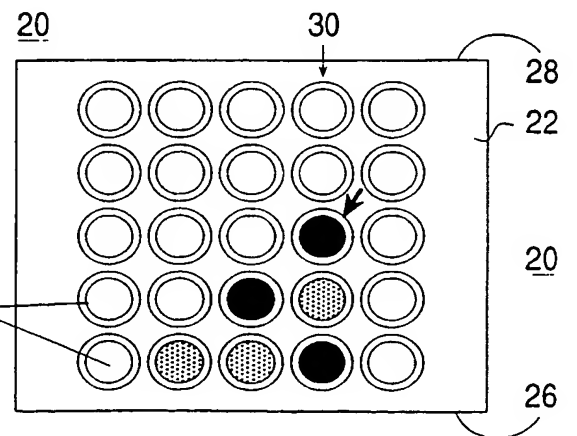


FIG. 7

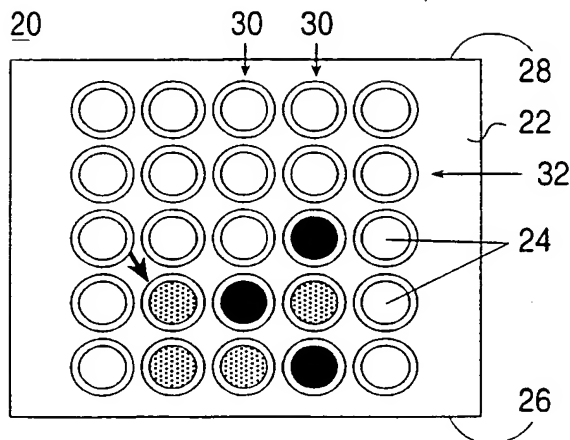


FIG. 8

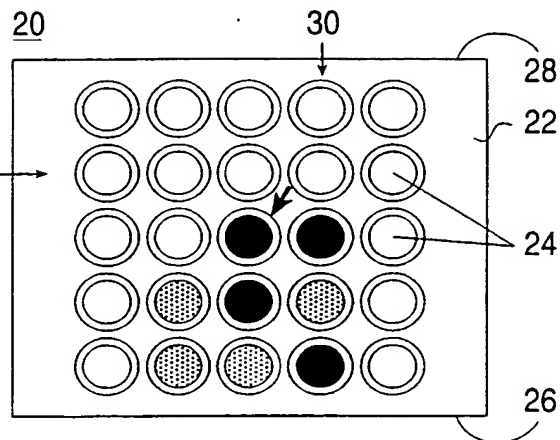


FIG. 9

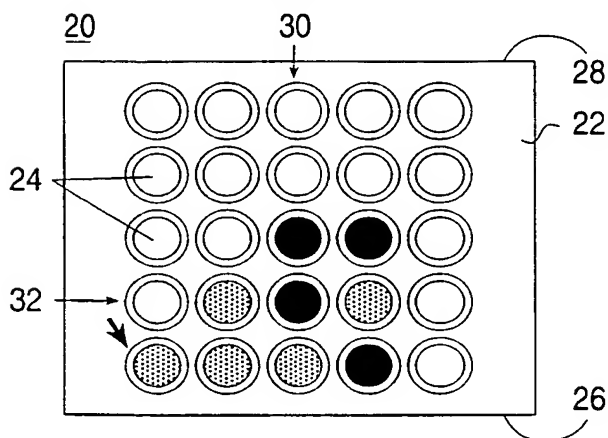


FIG. 10

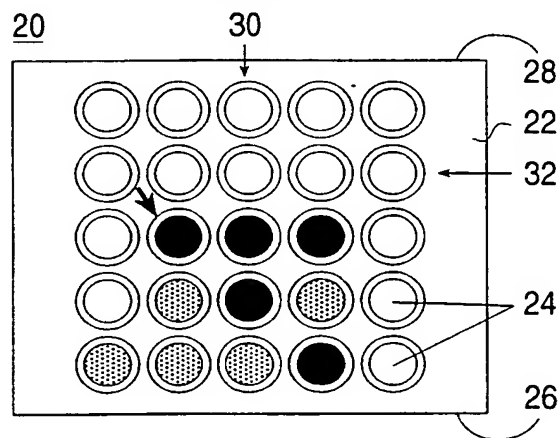


FIG. 11

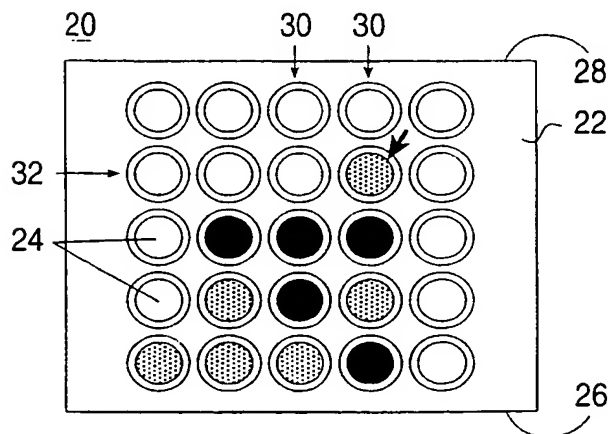


FIG. 12

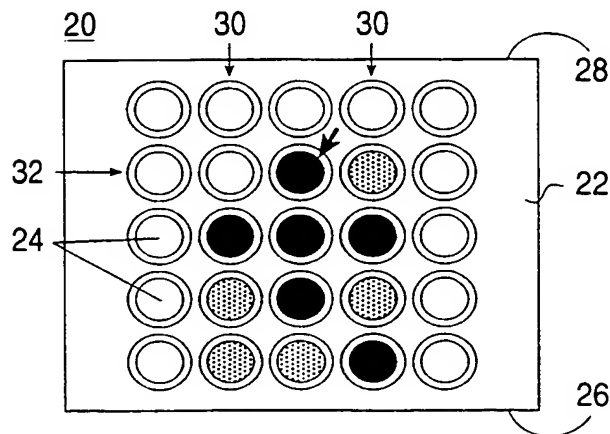


FIG. 13

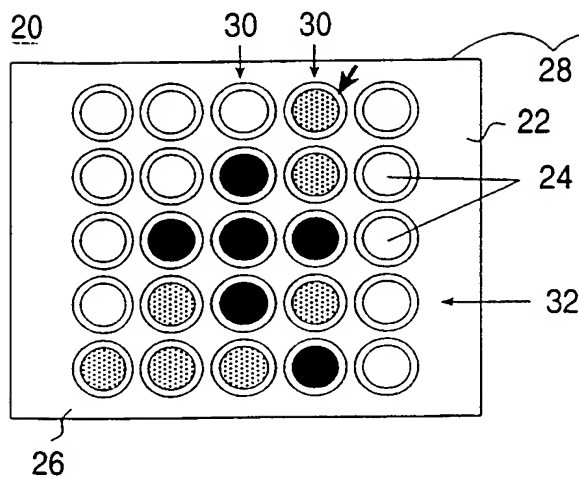
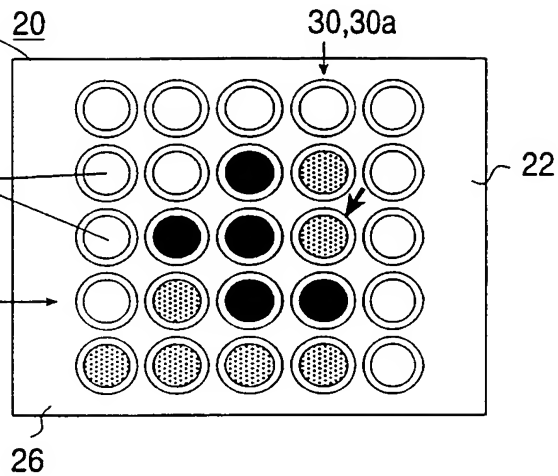


FIG. 14



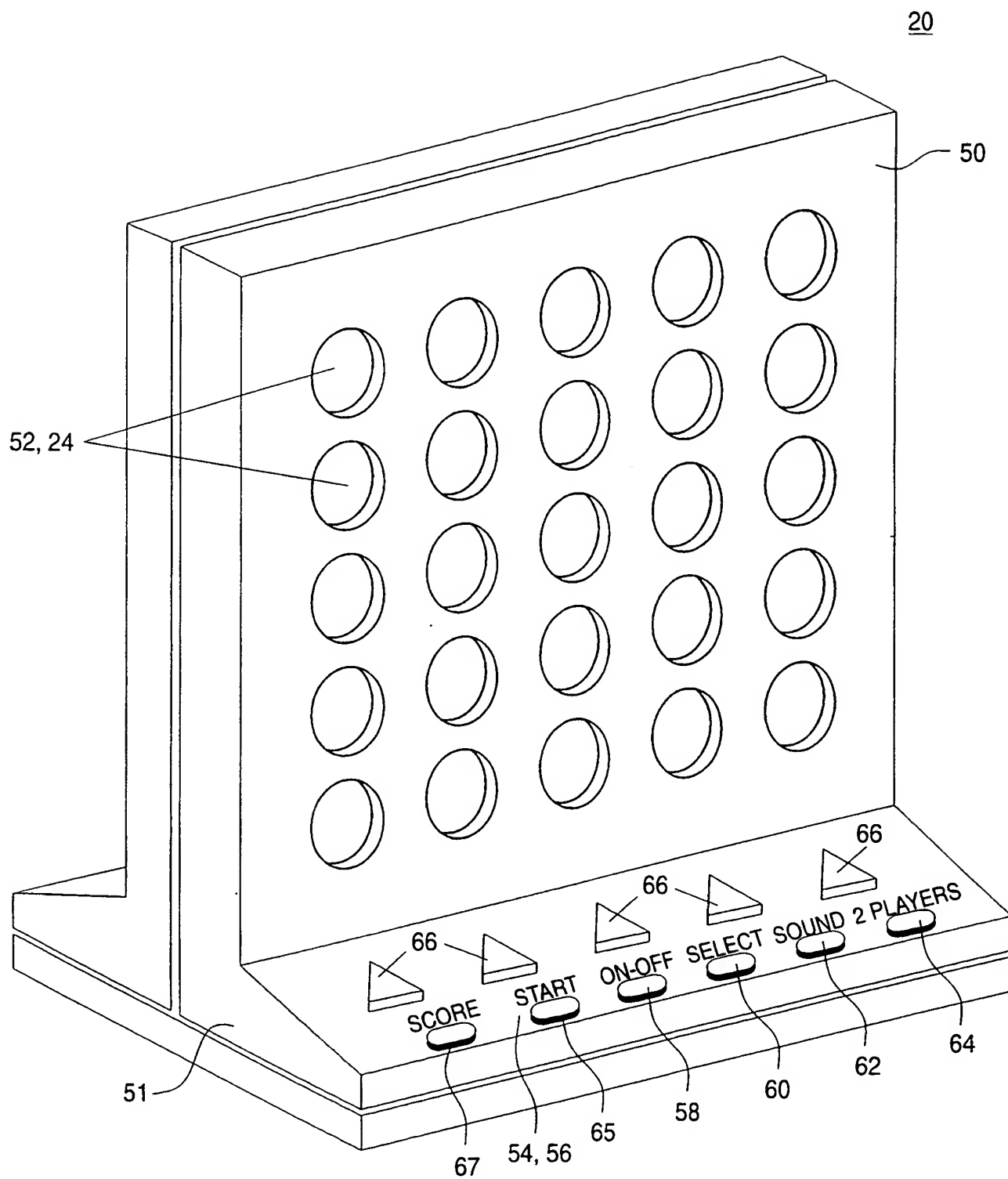


FIG. 15



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US98/11803

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : A63F 9/22

US CL : 463/9

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 463/9, 10, 14; 273/237, 271, 460

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	Systema's "Four-In-Line" game board, Toys & the Retailer, March 1985, page 22.	1,5,6,8-12,14-17 ----- 2,3,4,7,15
Y	US 4,244,635 A (SASAKI et al) 13 January 1981, whole document.	2
Y	US 5,215,311 A (SCHULLER) 1 June 1993, whole document	3,4

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	*T*	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A*	document defining the general state of the art which is not considered to be of particular relevance		
*E*	earlier document published on or after the international filing date	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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*O*	document referring to an oral disclosure, use, exhibition or other means		
*P*	document published prior to the international filing date but later than the priority date claimed	*&*	document member of the same patent family

Date of the actual completion of the international search

28 JULY 1998

Date of mailing of the international search report

18 AUG 1998

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

For MICHAEL O'NEILL

Telephone No. (703) 308-1148

*Shirley Vency*  
Shirley Vency  
Paralegal Specialist  
Group 3700

